

REMARKS/ARGUMENTS

Upon entry of the present amendments, claims 1, 3-5, 9-17, 20-25, and 29-41 are pending in the present application. Dependent claims 2, 6-8, 18-19, and 26-28 have been cancelled. Independent claims 1 and 3 have been amended. Dependent claims 3-5, 9-16, and 20-25 have been amended by removing the wording "or method" to correct for the informality. Dependent claims 4-5, 9-17, and 20-25 have been further amended. New dependent claims 29-41 have been added. Reconsideration of the application is respectfully requested in light of the foregoing amendments and the following remarks.

Claim 1 has been amended to incorporate certain elements from the disclosure, in particular the variable intensity of the source radiation and the frequency response tuning of the detector. This amendment finds support throughout the specification, specifically at page 7, lines 17-18, disclosing that the source generates a radiation spectrum that is commensurate with the application, and at page 12, lines 19-21, disclosing that the application of the electrical bias on the detector can be used to change the detector's cut-off frequency. Independent method claim 3, which closely parallels the apparatus of claim 1, has been similarly amended.

Claims 4 and 5 have been amended to correct typographical errors, to remove the wording "or method," thereby removing the informality reported by the Office Action, and also to clarify that the intensity of the source is varied.

Claims 9 has been amended to correct typographical errors, to remove the wording "or method," thereby removing the informality reported by the Office Action, and also to clarify that the width of the depletion zone is varied. This amendment finds support throughout the specification, specifically at page 13, lines 13-16, disclosing the use of bias voltage to cause band sweep on the detector.

Claim 10 has been amended to correct typographical errors and to remove the wording "or method," thereby removing the informality reported by the Office Action.

Claim 11 has been amended to correct typographical errors, to remove the wording "or method," thereby removing the informality reported by the Office Action, and also to make this claim dependent on claim 9.

Claims 12-16 have been amended to correct typographical errors and to remove the wording "or method," thereby removing the informality reported by the Office Action.

Claims 17, 20, and 21 have been amended to better define the invention, without changing the scope of the claims.

Claims 22-25 have been amended to correct typographical errors and to remove the wording "or method," thereby removing the informality reported by the Office Action.

New dependent claim 29 is drawn to an analyzer or spectrophotometer where the intensity of the source radiation is varied by switching the source on. This amendment finds support throughout the specification, specifically at page 10, lines 13-21, disclosing that the variation of the light intensity of the source can be detected through, for instance, voltage measurements on the source filament. New dependent claim 30 is a method claim that closely parallels apparatus claim 29.

New dependent claims 31-41 are added in order to overcome the Office Action formality objection against combining an apparatus and a method in a single claim. New dependent claims 31-41 are the method claims that closely parallel those objected-to claims where the wording "or method" was removed.

The claims are rejected under 35 U.S.C. § 102(b) and § 103. Each of these rejections and objections is addressed below in the order set forth by the Office Action.

I. OBJECTION BASED ON INFORMALITIES

Claims 4-16 and 20-25 have been objected to because of certain informalities. In particular, the Office Action requested that the wording "or method" should be deleted. The wording has been deleted in the amended claims 4-16 and 20-25.

II. REJECTION UNDER 35 U.S.C. § 102(b) OVER MATHISEN

Claims 1-8, 12-13, and 17-25 are rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by Mathisen et al. (US Patent No. 4,158,505) [hereinafter Mathisen].

Applicant respectfully traverses the rejections in view of the explanation below.

In order to further the prosecution of the presently pending claims, Applicant has amended independent claims 1 and 3 as set forth above. The independent claims 1 (for the apparatus) and 3 (for the method) have been amended to recite the following additional elements, namely: (1) a variable frequency of the source radiation, the variable frequency being controlled by varying the intensity of the source, and (2) a frequency tuneable detector having controllable response to different incident radiation frequency bands. The amendment finds support throughout the specification, as indicated above.

Regarding the first additional element in amended claims 1 and 3, in the claimed invention the intensity of the source radiation is varied to provide a range of frequencies. That is, at each intensity, the radiation contains a relatively broad range of frequencies. Varying the intensity of the source radiation in this manner produces different frequencies. This ultimately produces more information at the detector.

In contrast, the apparatus in Mathisen does not vary the intensity of the source radiation in order to produce a range of frequencies. Mathisen can only provide varied source radiation frequencies by using filters. Mathisen does not disclose varying the source radiation frequency by varying intensity.

Providing a range of frequencies from the source radiation by varying intensity, as defined in claims 1 and 3, enables more information to be obtained by the detector for the purpose of determining the characteristic of the sample. The apparatus of Mathisen attenuates (through filtering) most frequencies from the source radiation by mechanical filtering, so as such it provides less information. This teaches away from the present invention, which endeavors to utilize a broad range of source radiation frequencies to improve performance.

Regarding the second additional element in amended claims 1 and 3, in the claimed invention the response frequency band of the detector is varied to produce a plurality of detector response frequency bands. The cutoff wavelength response of the detector changes with the thickness of the pn-junction depletion region, which, in turn, is controlled by changing electrical bias on the pn-junction through the controllable current source 2. Therefore, a single detector 35 can be forced to have different responses to the bands of wavelengths. Each response frequency band is produced to detect an associated or corresponding range of frequencies of source radiation produced by varying the intensity of the source. A plurality of light intensity measurements is performed on the detector 3 at different electrical bias levels, resulting in distinct measurements of the detected light intensity per specific wavelength band. This set of measurements is used to improve accuracy of the measured specimen properties.

In contrast, the apparatus in Mathisen cannot control the response frequency band of the detector such that the response corresponds to or is associated with a range of frequencies produced by the source radiation through intensity variation. The apparatus in Mathisen uses an array of light detectors, like, for instance, 256 photodiodes as described in column 5, lines 24-34. The light detectors in Mathisen are pre-tuned to be responsive to a particular band of wavelengths. This is also reflected by limitation of claim 1 in Mathisen: "... each of said diodes being associated with light energy of a different and predetermined wavelength..." (column 15, lines 54-56).

The advantages of the tuneable detector in the present invention, over the pre-tuned array of the detectors in Mathisen, are numerous. A smaller number of light-sensitive detectors is used in the present invention, making the present invention cost effective in comparison to Mathisen. Furthermore, a tuneable detector can be controlled into being responsive to different wavelength bands through the change in electrical bias, as dictated by the needs of a particular measurement, whereas an array of pre-tuned light detectors does not have this flexibility. Characteristics of the sample can then be determined by using the output obtained for each frequency detector response band when it has detected the signal affected by the sample from incident source radiation which has an associated range of frequencies. A

combined set of data can be obtained from the single detector by detecting incident radiation covering a far broader range of frequencies. The detector response frequency is varied into bands that “match” the source radiation frequencies, thus increasing the amount of useful information obtained for later processing.

Therefore, since Mathisen does not disclose all the limitations of the amended independent claims 1 and 3, Applicant submits that claims 1 and 3 are not anticipated by Mathisen, and, hence, are allowable. Furthermore, dependent claims 3-5, 12-13, 17-25, and 29-41 have limitations in addition to those of their parent claims 1 or 3. Therefore, considering that claims 1 or 3 are allowable, Applicant submits that dependent claims 3-5, 12-13, 17-25, and 29-41 are also allowable as depending from the allowable parent claims.

III. REJECTION UNDER 35 U.S.C. § 103 OVER MATHISEN IN VIEW OF DYMENT

Claims 9-13 are rejected under 35 U.S.C. § 103(a) as allegedly being obvious over Mathisen in view of Dymnt (US Patent No. 3,995,082) [hereinafter Dymnt]. Applicant respectfully traverses the rejections in view of the explanation below. Please note that in order to further the prosecution of the presently pending claims, Applicant has amended independent claims 1 and 3 and dependent claim 9 as set forth above.

Dependent claims 9-13 depend from, and add further limitations to, independent claim 1. As set forth above, independent claim 1 has been amended to overcome the Mathisen reference. The Applicant respectfully submits that the deficiencies of the Mathisen reference are not overcome by the Dymnt reference.

Applicant respectfully submits that the person skilled in the art of spectrophotometry would not incorporate Dymnt's light detection diode with the varying width of the depletion zone into the Mathisen reference. The person skilled in the art of spectrophotometry would attempt to adopt Dymnt's diode with the variable width of the depletion zone in a spectrophotometer only if a method for controlling the frequency bandwidth of the incoming radiation is also available. In the absence of this control mechanism, the person

skilled in the art would not recognize the value of Dymment's diode for its ability to match the source radiation bandwidth, and, thus, increase the accuracy of the measurements. Instead, the person skilled in the art is likely to attempt a development of an array of sensors, which collectively cover any expected band of the incoming radiation frequencies, exactly as Mathisen did.

Mathisen used an array of pre-tuned diodes for the detector, each diode having a fixed wavelength band response, as disclosed in Mathisen at column 12, lines 31-36. If the diode with the varying width of the depletion zone, as in Dymment, were to be combined with Mathisen, this hypothetical combination would simply lead to an array of non-tuned diodes replacing Mathisen's array of pre-tuned diodes, effectively taking away value from Mathisen's invention. Therefore, even if the Dymment diode were to be combined with Mathisen, the resulting combination would lack the adjustment mechanism of the width of the depletion zone, as recited in dependent claim 9. This adjustment mechanism takes advantage of the different frequency bands of the incoming radiation intensity by matching the incoming radiation frequency band to the response band of the detector diode, in turn resulting in more precise measurement sets.

At least for these reasons Applicant respectfully submits that dependent claim 9 is allowable over the hypothetical combination of Mathisen and Dymment. Furthermore, considering that dependent claims 10-13 include all the features and elements of their amended parent claims, Applicant submits that these claims are also allowable as depending from the allowable parent claims.

IV. REJECTION UNDER 35 U.S.C. § 103 OVER MATHISEN IN VIEW OF DYMENT, AND FURTHER IN VIEW OF ADAMS

Claims 14-16 are rejected under 35 U.S.C. § 103(a) as allegedly being obvious over Mathisen in view of Dymment, and further in view of Adams et al. (US Patent No. 7,154,599 B2) [hereinafter Adams]. Applicant respectfully traverses the rejections in view of the explanation below. Please note that in order to further the prosecution of the presently pending

claims, Applicant has amended independent claims 1 and 3, and dependent claim 9 as set forth above.

Regarding the rejection of claims 14-16, as allegedly being obvious over Mathisen in view of Dymment, and further in view of Adams, Applicant again respectfully submits that, as explained in the argument for patentability of claims 9-13 above, amended dependent claim 9, which is the basis claim for claims 14-16, contains limitations which make it non-obvious over the hypothetical combination of Mathisen and Dymment.

Next, as to the Adams reference, independent claim 1, which is the basis for the dependent claim 9, is now amended to add the element of the variable frequency of the source radiation. Adams does not suggest a variable frequency source. Instead, Adams suggests a specific type of frequency source (LED, incandescent, or similar, e.g. see in column 3, lines 53-55), but with no suggestion to provide a range of frequencies from the source radiation by varying the source radiation intensity. Replacing the variable frequency radiation source, as it exists in the presently pending claims, with a source of fixed spectral property, would, in fact, result in an invention of lesser value, due to the reduction in the number of the independent measurement pairs obtainable. Therefore, the person skilled in the art would not attempt to combine the Adams source with the hypothetical combination of Mathisen and Dymment.

Nevertheless, assuming that such a hypothetical combination of a specific frequency source, as in Adams, and the spectrum analyzing system, as in the Mathisen and Dymment hypothetical combination, is assembled, the combination would result in either (1) mismatched spectral properties of the source versus the detector, or, at best, (2) only partially matched spectral property of the Adams source to the Dymment detector in the Mathisen spectrophotometer. Contrary to the above scenario, the presently pending claims can tune spectral properties of the radiation source against the spectral properties of the detector to achieve more precise measurements by matching source-detector spectral properties.

At least for these reasons Applicant respectfully submits that dependent claim 9 is allowable over the hypothetical combination of Mathisen, Dymment, and Adams. Furthermore,

considering that dependent claims 14-16 include all the features and elements of their amended parent claim 9, Applicant submits that these claims are also allowable as depending from the allowable parent claim.

CONCLUSION

In view of the foregoing, Applicant submits that this application is in condition for allowance, and a formal notification to that effect at an early date is requested.

If the Examiner believes a telephone conference would expedite prosecution of this application, please telephone the undersigned at (415) 576-0200.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "J. Mihailovic". The signature is fluid and cursive, with the first letter "J" being large and prominent.

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